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ABSTRACT

This keynote address focuses on equity in science and mathematics education. The science and math achievement of minority and poor children are discussed from an instructional policy perspective with emphasis on who gets access to what knowledge. The discussion about the politics of knowledge acquisition involves a discussion of race, class, and gender and highlights the fact that even though there have been substantial gains, the fact remains that a student's status as minority or poor or female severely impairs that student's likelihood of acquiring a quality educational experience, particularly with regard to science and math. An analysis of data reveals that with respect to curriculum there are no substandard schools; however, there are significant differences in teacher qualifications and teacher attitudes. Compared to students not in poverty, students in poverty are more likely to have a science teacher who is either without certification at all or not certified in science and are more likely to be taught by teachers who have negative attitudes toward science and do not encourage students to do their best or to do homework. Personal reflections on life as a middle-school science teacher are presented along with a discussion of the goals and activities of the Georgia Initiative in Mathematics and Science (GIMS). (JRH)

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A Perspective on Race Equity and Science and Math Education: Toward Making Science and Math for All

by

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A Perspective on Race Equity and Science and Math Education: Toward Making Science and Math for All

Good afternoon! I am here in several capacities today. As a university professor, one of my areas of specialization is educational policy. Additionally, I teach a graduate course, the Politics of Education, in which course participants engage in the discussion we are ready to have about race, gender, and access to knowledge. And I am a former middle school science teacher. Much of what I will share with you about the science and math achievement of minority and poor children will be from an instructional policy perspective. And I will talk, like we do in my Politics of Education class, about who gets access to what knowledge.

This discussion about the politics of knowledge acquisition involves a striking discussion of race, class, and gender. The resounding message of this discussion is that though there have been substantial gains, the fact remains that a student's status as "minority" (particularly African American or Hispanic), or as poor (with an average family income of less than $15,000), or female severely impairs that student's likelihood of acquiring a quality educational experience, particularly with regard to science, math..

Our educational system (from kindergarten to the postdoctoral level) still views and treat many minority, poor, and female students as undeserving of quality math and science instruction. The message of tracking which disproportionately negatively affects Black and poor children is that you will not get the quality instruction nor the quality curriculum. This distressing fact has been documented and re-documented, in persuasive and emotional treatises from Jeannie Oakes to Jonathan Kozol.

Let's look at the data in this regard. The National Center for Educational Statistics 1994 Report and the text Policies for At Risk Students are particularly illuminating. My discussion, drawn from

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these works and my own research, will focus on the middle school level, as that is my background as well as a Georgia Initiative in Mathematics and Science (GIMS) focus. First, with regard to students identified as "in poverty" --in urban districts the majority of poor students are Black and Hispanic; in suburbia and rural districts they are white. But across community types the lesson of poverty is the same. When students are poor the quality of educational opportunity declines.

Do students in poverty receive the same kind of curricular offerings as students not in poverty? In terms of curriculum requirements data do not show any substandard schools. Don't be surprised by this finding, however, school district's usually set curriculum requirements and standards for all students -- for example the number of courses required in English, math, science, etc. Where real difference becomes apparent is when we analyze teacher qualifications and attitudes. Across community type - urban, suburban, or rural - students in poverty are more likely to be taught by inexperienced teachers (those with 2 years or fewer in the school) and by teachers who are either without any certification or not certified to teach the subject they are teaching.

Urban poverty students (the majority of whom are Black and Hispanic) are **twice** as likely (when compared to non poverty students in suburbia or rural districts) to have a science teacher who is either without certification at all, or not certified in science. This disturbing pattern is consistent across **three** other subject matters as well - math, English, and social studies.

Furthermore, as reported by school administrators in urban and suburban schools, more students in poverty than students not in poverty are taught by teachers who have negative attitudes toward students and are less likely to encourage students to do their best or to do homework. The poverty status of the child alone, dictates the likelihood of that child encountering a teacher who encourages or

expects students to do homework, has high morale, or has a negative attitude about students.

Sixty to seventy percent of the time, poverty students are taught by teachers who do **not** encourage them to do their best or to do their homework. This, compared to their non poverty peers who, 70 to 80 percent of the time, **do** have teachers who expect them to do their best and to complete their homework. Only about 20% of teachers of poverty student (across community types) report high morale. More striking and disturbing data reveals that 71% of teachers in urban settings who teach poverty students report having negative attitudes about their own students. And students in this setting are also about 10% less likely to encounter a teacher who responds to the individual needs of the student.

Further, the poverty status of a school (based on the percentage of students who receive free or reduced lunch) also provides information about student achievement on standardized tests. Students in poverty who attend schools with a **low** concentration of poor students have higher test scores than their counterparts in schools with a **high** concentration of poor schools. .The overwhelming message is that the poverty or non poverty status of a student, alone, dictates the quality of instruction and quality of teacher a student will encounter. This, before we even get to the matter of the child's abilities and potentialities.

We clearly see that several consequences exist in schools which serve poverty students. Effort should continue to focus on diminishing these deficiencies. School based programs should emphasize:

1. recruiting and retaining credentialed, able, and motivated teachers;
2. state-of-the-art math and science curricular and instructional materials;
3. curricular and instructional materials which highlight the contributions of African American and female mathematicians and scientists;

4. recruiting and retaining African American and female math and science teachers;
5. curricular and instructional materials which make science and math knowledge relevant to every day life.

I'd like to share some brief reflections on my life as a middle school science teacher. I taught in Ohio, in an urban school which served poor, minority (African American) children. The school had over 90% of its students on free/reduced lunch. There was a 92% request for transfer rate among teachers. My experiences were both challenging and rewarding. My reflections include the following. We, as educators, would be wise to:

1. attend to science as an opportunity to answer questions about life; to identify science as an endeavor of African American (Hispanic and Asian) people and females;
2. access African American graduate students, physicians, professors, and other science/math professionals to regularly visit classrooms, conduct experiments, give lectures, and take students on tours of the local medical school/university, laboratories, and science centers.
3. talk positively about college; going through the specific "steps to success"; teaching and testing students on what it means if you say you want to be a doctor, lawyer, teacher, scientist (I recall one of my sixth graders, Darius, saying that he wanted to study medical ethics in college as a result of a classroom discussion which evolved when we did a dissection of a fetal pig). Many students and their parents are totally unfamiliar with postsecondary education and do not understand what is necessary to become a physician, etc.
4. have regular contact with parents/guardians via weekly evaluation folders which contain samples of the student's work, grade averages, awards/recognition, behavior concerns, and the like.

Finally, as a professor at an Historically Black College/University (HBCU) I would be remiss if I didn't discuss the critical, essential role

of HBCU's in preparing this country's cadre of African American scientists, engineers, mathematicians, and physicians. At this time when federal funding and support of Howard University in Washington, D.C. (one of the nation's most preeminent institutions) and other HBCU's is threatened , it is important that you, as educational leaders, have vital information.

First, let's look at the record of HBCU's. Which universities award the most number of **baccalaureate degrees** to African-Americans? Howard University and Hampton University. The most **master's degrees (all fields combined)**? Howard University, Columbia University, Clark Atlanta University, and Ohio State University(#9). Most **baccalaureates in Engineering/Computer Science/Math**? The top 5: North Carolina A&T, Prairie View A&M, Southern University, Howard University, (and in a tie for 5th place) Tuskegee, and Florida A&M. The most number of **master's degrees in science fields**? Georgia Technical Institute, Howard University, our own Clark Atlanta University (#8). The most **science doctorates**? Massachusetts Institute of Technology (MIT), and Howard University.

Here again, the message is clear. First, HBCU's, particularly Howard University, have an immensely Herculean record and have been an untouchable and exemplary model for preparing African American scientists, mathematicians, engineers, scientists, and physicians. Howard University School of Medicine and Meharry Medical College alone are almost single handedly responsible for producing African American physicians. Secondly, if you destroy Howard University and other HBCU's (via funding cuts) you seek to destroy the **highly competitive** cadre of scientists and mathematicians, engineers, physicians, and Ph.D.'s who graduate from these esteemed schools.

In summary I am very encouraged by the goals and activities of GIMS. We as educators much keep a constant vigil. Many children suffer daily because those of us who create and implement educational policy are either unaware or uninterested.

We each have a vested interest in the progress of all children. It is sad to think, that five years from a new millennium, that promises to usher in all kinds of miraculous technological advances, most are still largely unconvinced that little black boys and little black girls can and should be leading this nation's and the world's technological revolution. We **don't** need unusual curricular or instructional materials or facilities for this to happen. What the data tells us, is that we **do** need the structures of poverty, racism and sexism to be annihilated so that all of us and our children are free to move forward. We need to muster the *will* to educate all the children!